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Optics for EUV, X-Ray, and Gamma-Ray Astronomy V  
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TITLE: *Forming Mandrels for X-Ray Mirror Substrates*

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ABSTRACT:

Future x-ray astronomical missions, like the International X-ray Observatory (IXO), will likely require replicated mirrors to reduce both mass and production costs. Accurately figured and measured mandrels – upon which the mirror substrates are thermally formed – are essential to enable these missions. The challenge of making these mandrels within reasonable costs and schedule has led the Goddard and Marshall Space Flight Centers to develop in-house processes and to encourage small businesses to attack parts of the problem. Both Goddard and Marshall have developed full-aperture polishing processes and metrologies that yield high-precision axial traces of the finished mandrels. Outside technologists have been addressing challenges presented by subaperture CNC machining processes: particularly difficult is the challenge of reducing mid-spatial frequency errors below 2 nm rms. The end-product of this approach is a realistic plan for the economically feasible production of mandrels that meet program requirements in both figure and quantity.